FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 703. (No. 24, Vol. XIV.) JUNE 15, 1922 [Weekly, Price 6d. Post free, 7d.

Flight,

The Aircraft Engineer and Airships

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C. 2

Telegrams: Truditur, Westcent, London. Telephone: Gerrard 1828

Annual Subscription Rates, Post Free:

United Kingdom .. 30s. 4d. Abroad .. .. 33s. 0d.*

These rates are subject to any alteration found necessary under abnormal conditions and to increases in postage rates

* *European subscriptions must be remitted in British currency*

CONTENTS

DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

1922.	
June 19	**Independent Air Force, R.A.F., Dinner, Hotel Cecil**
June 23-25	**International Competition for Touring Aeroplanes, Brussels**
June 24	**Royal Air Force Pageant, Hendon**
June 27	**Royal Aero Club 21st Anniversary Banquet**
July 29	**Aerial Derby, starting at Waddon**
Aug. 6–20	**French Gliding Competition**
Aug. 6	**Gordon-Bennett Balloon Race, Geneva**
Aug. 7	**R.Ae.C. Race Meeting, at Waddon**
Aug. (last fortnight)	**Schneider Cup Seaplane Race, at Naples**
Sept.	**Tyrrhenian Cup, Italy**
Sept.	**Italian Grand Prix**
Sept. or Oct.	**R.Ae.C. Race Meeting, at Waddon**
Sept. 22	**Coupe Deutsche (300 kil.)**
Dec. 15–Jan. 2	**Paris Aero Exhibition**
1923.	
Dec. 1	**Entries Close for French Aero Engine Competition**
1924.	
Mar. 1	**French Aero Engine Competition.**

INDEX FOR VOL. XIII.

The Index for Vol. XIII of FLIGHT (January to December, 1921) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 1s. per copy. (1s. 1d. post free).

EDITORIAL COMMENT.

IN this issue of FLIGHT we publish an article on the subject of Civil Aviation and safety, and call attention to some of the reasons which would appear to make a continued exploitation of the London-Paris service upon the present conditions a waste of effort. The weather conditions on that route are far from favourable, and necessitate a ground organisation of such magnitude, in proportion to the traffic which can reasonably be expected, as to preclude the services coming within measurable distance of paying except by heavy subsidies. It is further pointed out that we should not object to any such expenditure if—and that appears to us to be the crux of the whole matter—there were any reasonable prospects of ultimate expansion into something more than the mere 240 miles separating us from the French capital. But we can see no such prospects. The route, as far as British machines and British lines are concerned, leads to nowhere except Paris. The route could undoubtedly be made considerably safer, but at a cost out of all proportion to the gains, present or potential, to be expected. It is, therefore a pertinent question to ask—why continue to specialise on this route to the exclusion of all others.

Civil Aviation and Safety

By way of indicating alternative routes, the article suggests making much fuller use of the seaplane type of aircraft than has been done in the past. The subject of the seaplane is one to which we have had occasion to refer frequently of late, partly because there appears to be a lack of realisation of its possibilities in Government circles, and partly because, from the point of view of national safety, we shall require large numbers of seaplanes in the not distant future for co-operation with the Navy. In the article to which we refer no mention has been made of the uses of the land machine on routes other than the London-Paris. This is not because we have the

slightest intention of belittling what the land machine can do, or because we desire to see the seaplane developed at the expense of the aeroplane. Far from it ; but the case for the aeroplane has been stated so well and so often that we feel there is no need to repeat it in the present argument. The land machine has enormous possibilities, but we do plead for not letting these blind us to the uses of the seaplane, and we would emphasise the need for developing the seaplane side by side with the aeroplane, not one at the expense of the other.

There can be very little doubt that a properly designed seaplane, used over a route which comes well within its capacity, is safer than very fast land machines as long as there is any risk of forced landings. On the London-Paris route there have been a number of forced landings during the last few months. Fortunately, however, these have been made under favourable weather conditions, and no serious damage has resulted. But if the services had attempted to run during foggy weather, and had been forced to alight on unknown ground in the fog, it can scarcely be doubted that serious accidents would have resulted.

The seaplane, on the other hand, is much more easily " landed " in a fog. Instruments are available which will indicate to the pilot when he is at a certain height above the sea. The matter of making a safe *amerissage* is not then a difficult one. There are no hills and valleys, nor any hedges or other terrestrial obstacles. In other words, there is always an " aerodrome " below the seaplane. There is, of course, the possibility of a ship being on this " aerodrome," but except in or near a crowded harbour, the risk of collision is not very great.

Owing to the fact that a commercial seaplane need not have a very high " ceiling," having no hills to surmount, nor the need to climb to considerable heights so as to be within gliding distance of some landing ground, the power can be expended in load carrying, and consequently the seaplane should be capable of carrying a greater percentage of useful load. In other words, it should not require such a large subsidy to make it pay as does a fast land machine such as is apparently required on the London-Paris route. Furthermore, there are no special emergency landing grounds to establish, and no special lighthouses, the seaplane being able to make use of existing ones, as well as of the usual customs and passport organisations. All this points to a saving in expenditure on what we might term incidentals, which would mean that more money could be spent on improvements in the machines themselves.

As a direct result of ours being an island Empire, we shall need large numbers of seaplanes, and the training of seaplane personnel takes very much longer than does the training of personnel for land machines. How are we to train this personnel if we do not provide a civilian seaplane service ? The last war was fought almost exclusively on land machines. There is good reaon to suppose that the next war will see a very marked change, and that the greater part of the matériel for naval use will be seaplanes. There appears to us to be every reason for developing the seaplane, and as it offers possibilities of doing so commercially at relatively small cost, there is all the more reason for beginning at once. The London-Paris service must be kept up, but we think that it should most certainly not be kept up exclusively and at the expense of others offering better prospects of becoming paying propositions.

* * *

The Double Cross-Channel Night Flight

Following closely upon the official flight of the Handley Page machine with General Brancker on board, from Croydon to le Bourget, a second—this time a double—journey has been made across the Channel by night. The machine used was a Farman Goliath belonging to the Grands Express Aériens piloted by M. Labouchere, the famous French pilot. Leaving le Bourget at 10.22 on June 7, with eight passengers on board, the Goliath proceeded towards the coast. At first, thunder and rain were encountered, but later the machine ran into clear weather. The light at Lympne could be seen before the machine left the French coast, and the Croydon light became visible approximately at Tonbridge. Before alighting M. Labouchere switched on the two searchlights under his planes, and made a perfect landing on the Waddon aerodrome. After a supper at the aerodrome hotel the machine left again at 2.50 a.m., arriving safely at le Bourget a few minutes after 6, having completed the double journey.

The performance was a very fine one, and points to the not far distant day when night flying over a properly organised route will be as simple as flying by day. We are not very certain that night flying on the London-Paris route is any very great advantage, but for longer journeys the capacity to fly in the dark is equivalent approximately to doubling the speed of an aeroplane. If a machine flies for 12 hours at 100 m.p.h., and then has to stop overnight for another 12, its real speed is, of course, only 50 m.p.h. Thus night flying should have very great commercial advantage, and the flights made recently may therefore be regarded as first steps in a new stage of progress.

* * *

The Lisbon–S. America Flight

As briefly recorded in last week's issue of FLIGHT, the Portuguese aviators, Commander Sacadura Cabral and his navigator, Capt. Gago Coutinho, have at last succeeded in completing their flight across the South Atlantic. Two machines were smashed, but on the third seaplane sent out, a standard Fairey C III, with Rolls-Royce " Eagle " engine, the aviators succeeded in flying from Fernando Noronha to the mainland, reaching Pernambuco. Since then news has reached this country that they have arrived at Bahia, and barring very bad luck, they should get to Rio safely. The flight has been one of difficulties, and the greatest credit is due to the skilful navigation of Capt. Coutinho. Our old allies the Portuguese were ever good navigators at sea. They have now proved to be equally to the front in air navigation, and we feel proud to think that two British firms have been associated with them in the historical flight to South America.

* * *

The King's Congratulations

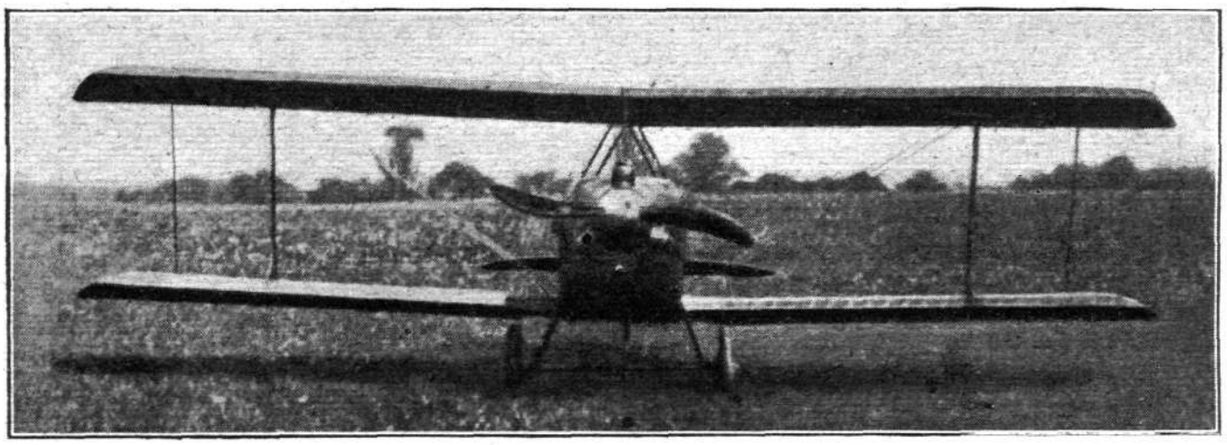
The King, in a message which he has addressed to the President of the Portuguese Republic in connection with the flight, says :—

" Please accept my warm congratulations and those of my people on the successful issue of the daring enterprise of Portuguese aviators in their memorable flight to South America. This great achievement, which commands the admiration of the world, is worthy of the Portuguese nation, and adds further lustre to its annals."

FLIGHT

THE BACO "SKYLARK"

PARTICULARS are to hand of yet another small, low-powered machine of American origin possessing several distinctive features. This is the BaCo "Skylark," designed and constructed by the Bethlehem Aircraft Corpn., of Bethlehem, Pennsylvania, U.S.A., a two-seater tractor biplane fitted with a 60 h.p. 3-cyl. Lawrence air-cooled engine. The pilot and passenger are seated side by side, an arrangement that has much in its favour but which is not very often adopted by designers. As may be seen from the accompanying illustrations, in general appearance this machine is not unlike the Eastchurch and Grain "Kittens" (designed by the Experimental Construction Dept. of the R.N.A.S. during the War), nearly grown up to a "Cat." It is stated that the "Skylark" possesses remarkable inherent stability, and that on releasing the "stick" the machine will settle by itself to its natural flying angle, which may be varied by the adjustable stabiliser. It will do this from either of the two extreme positions of a stall or vertical nose dive. Its lateral stability is also good. Other qualities in the "Skylark" that make it particularly suitable as a sporting or popular general-purpose machine, are its low landing-speed, quick take off—on landing it rolls but a short distance after the wheels touch the ground—the ease with which it can be handled on the ground, low operating expense, and long flight duration. The provision of an adjustable tail plane in a small machine of this description is somewhat in the nature of a novelty, if not a luxury.



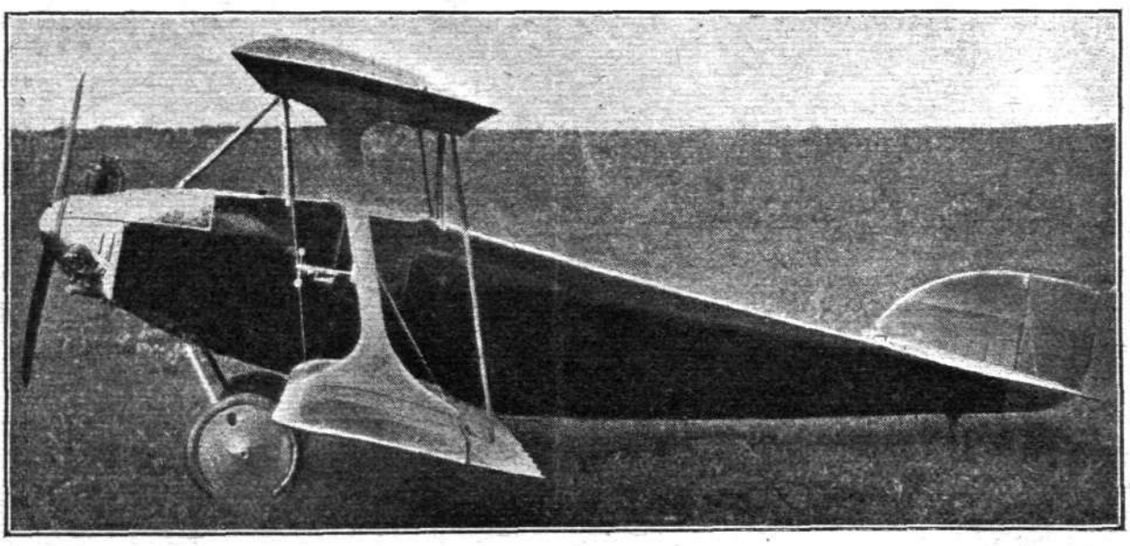
THE BaCo "SKYLARK": Front view.

The main planes are of the four-*aileron* type of even span and chord, with the top plane staggered forward 20 ins. They have no sweepback, but a dihedral angle of 1½°; the angle of incidence of the top plane is 1° and that of the lower plane 0°. The comparatively thick wing section employed is U.S.A. 27. Top and bottom planes are each in two units, the bottom ones being attached to the lower *longerons* of the *fuselage*, and the top ones to a *cabane* of two inverted V streamline steel struts; an additional streamline strut extends forwards from the top of the *cabane* down to the *fuselage*.

Front spars are of selected spruce, 4-ply laminated rectangular sections. Rear spars are of I-beam sections of spruce. They are built up so as to form a section similar to the ordinary routed spar. It consists of two spruce members of shallow U-shape, with the bottoms of the U side by side, and with a centre piece of $\frac{1}{16}$-in. veneer, the grain running vertically to take the longitudinal sheer.

Cap strips of the spars are of birch $\frac{1}{8}$-in. thick. Their construction is very logical since the veneer takes the horizontal shear across the grain, and the cap strips of birch utilise a material of high strength where the fibre stress is greatest.

The internal bracing system is of double swaged wires and forked ends attached to mild steel fittings bolted to the main spars, which are left solid at these points. Main plane fittings are of standard and simple design made up of plain mild steel sheet metal. Ample strength has been allowed on all fittings,



The BaCo "SKYLARK": Side view.

and no off-centre wire pulls are present anywhere in this machine.

The trailing edge of the wings is formed of wire, and hand-holes are provided on both lower wings to facilitate handling on the ground.

The wing truss is of clean design. The single I-struts which

are laminated and built up of spruce are of very generous proportion.

The double lift wires, front and rear, are of stranded cable. They run forward, as well as inward, serving both as external drift wires and flying wires. The landing wires extend from the front of the *cabane* in the centre to the front and rear of the bottom of the interplane struts. This places the rear landing wire out of the way of entrance to the cockpit. This, together with the strut running from the centre of the plane, from the top of the *cabane* to the forward part of the *fuselage*, completes the truss for stress of every character, and at the same time reduces the parasite resistance to a minimum; nevertheless the use of the deeply-cambered U.S.A. 27 wing section enables the weight of the wing truss to be kept down to a minimum.

Wing frames are covered with approved grade A cotton fabric, and special care has been exercised in sewing the fabric to the ribs in accordance with Army specifications. Surface treatment is of six coats of Phœnix fireproof dope with a bronze finish.

The empennage is substantially built; the stabiliser is hinged on the rear end so that a large degree of adjustment is possible in flight. Since the balance of the machine is perfect for normal performance, it is expected that the stabiliser adjustment will only be used when the pilot wishes to fly at one particular flight attitude for a long period of time.

The stabiliser, as shown in one of the accompanying illustrations, has a strong rear spar running continuously over-top of the *fuselage*. The laminated front edge is in one piece of semi-circular shape; three ribs on either side give it adequate strength and preserve the camber required. A strong spruce member runs on either side of the *fuselage* from the forward point of attachment of the stabiliser toward the outer end of the rear spar. Two wires run from the top of the rudder post to the outer end of the stabiliser spar, giving added security for severe manœuvres. The stabiliser and rudder are of similar construction, and are well braced internally. The elevator horns are skilfully disposed within the vertical fin, and a particularly strong torsion tube is provided to carry the elevator loads to the elevator horns. The design of the empennage is particularly sturdy and clean and combined with simplicity.

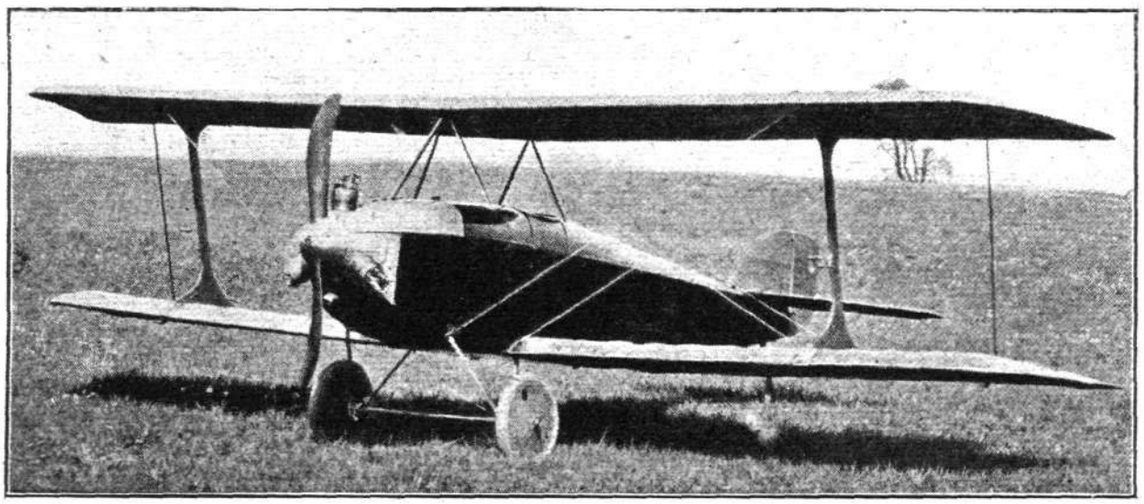
The *fuselage* is solidly constructed. A complete trussing is provided of four solid spruce *longerons*, with diagonal bracing members also of spruce. The whole is covered with mahogany, 3-ply veneer. Although very light, the *fuselage* has a strength far in excess of that required either in the air or on landing. Great care has been exercised not to weaken the *fuselage* at the point where the door to the cockpit is placed, special diagonal and longitudinal members being provided at that point to carry the truss through.

The smooth mahogany finish is particularly pleasing to the eye and touch. A veneer *fuselage* of this type eliminates all fittings and provides a good production job easy of repair. The combination of veneer with the complete wooden truss also eliminates all tendency for warping or distortion of veneer.

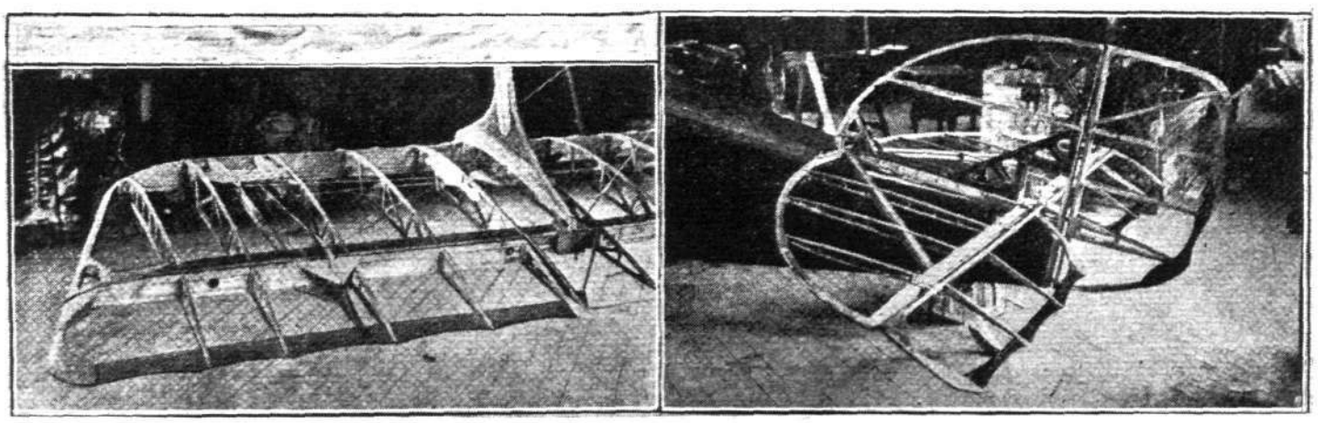
In the cockpit ample room is provided for two persons side by side, together with dual control. The instruments are symmetrically arranged on a dashboard clearly seen by either occupant. The engine controls—namely, switch, altitude adjustment and spark—are placed on the right-hand side. The throttle is placed between the occupants and easily accessible to both. The instrument board carries a banking indicator, turn indicator, air speed meter, altimeter, tachometer, oil pressure gauge, oil temperature gauge and air distance recorder. A compass completes the equipment.

The arrangement of the cockpit and instruments is such as to make a perfect dual control arrangement, but with more facility for engine control, thus giving to the pilot a valuable point in instruction flying.

The machine is easily entered by means of a low step on to the wing, and another low step into the cockpit through the



The BaCo " SKYLARK " : Three-quarter front view.



THE BaCo " SKYLARK " : Two views showing, on the left, a portion of the lower wing uncovered, and, on the right, the tail planes, also uncovered.

side-door entrance in the body. The control stick and rudder bars are of the standard type. The roomy upholstered cockpit, with attractive instrument board, presents a pleasing and comfortable compartment for the pilot and passenger. To carry a few hundred pounds of mail, express or baggage, instead of a passenger, the extra seat is pushed back, or removed, and the control stick is removed also, giving ample cargo space.

The chassis is of $\frac{5}{8}$-in. by $1\frac{1}{2}$-in. oval steel tubing brazed to a guide plate, which allows a 4-in. travel of the axle. The shock absorber cord is simply wound about two spools, provided on the axle, and down under the guide plates. The cross wiring for the chassis struts is provided on both the front and rear struts. Two compression tubes run between the lower end of the front and rear struts. The chassis is very simple in construction, and can be dismounted and assembled in a few minutes.

The 60 h.p. Lawrence engine efficiently blends into the nicely streamlined body, only the cylinders being exposed. It is supported by two steel plates, one on either side. These plates are bolted to the vertical veneer nose panel, which in turn is braced by two veneer tie-panels to the *longerons*. This eliminates all cross bracing wires in the first two sections, giving a very strong mounting. Two complete double ignition systems are provided with double batteries, so that either battery can be used on either system. Ample space is provided around the dual ignition system and oil leads to the engine. A fireproof wall separates the engine and ignition system from the petrol tank and cockpit, thus eliminating, as far as possible, risk of fire—the carburettor hanging outside and underneath the engine.

The principal characteristics of the "Skylark" are as follows:—

Span	29 ft. 10 ins.
Chord	4 ft.
Gap	5 ft.
Stagger	1 ft. 8 ins.
Overall length	23 ft.
Overall height	8 ins.
Wing curve	U.S.A. 27
Dihedral angle	$1\frac{1}{2}°$
Area of main planes	214 sq. ft.
Weight empty	700 lbs.
Useful load	600 lbs.
Loading/sq. ft.	5 lbs.
Loading/h.p.	19.3 lbs.
Speed range	33-90 m.p.h.
Climb (full load)	600 ft./min.
Ceiling	18,000 ft.
Duration	$4\frac{1}{2}$ hrs.
Petrol tank capacity	20 gals.
Oil tank capacity	2 gals.

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN JUNE 4 AND JUNE 10, INCLUSIVE

Route‡	No. of flights*	No. of passengers	No. of flights carrying: Mails	No. of flights carrying: Goods	No. of journeys completed†	Average flying time (h. m.)	Fastest time made by	Type and (in brackets) Number of each type flying
Croydon–Paris	52	102	19	37	52	2 19	D.H. 34 G-EBBS (1h. 58m.)	B. (5), D.H. 9 (1), D.H. 18 (1), D.H. 34 (3), G. (7), H.P. W8B (3), Sp. (2), V. (1), W. (1).
Paris–Croydon	53	123	9	34	52	2 40	D.H. 34 G-EBBS (2h. 2m.)	B. (6), D.H. 4 (1), D.H. 9 (1), D.H. 18 (1), D.H. 34 (3), G. (8), H.P. W8B (3), Sp. (1). V, (1), W. (1).
Croydon–Brussels ...	6	8	3	3	5	2 24	D.H. 34 G-EBBT (2h. 20m.)	D.H. 34 (2), W. (1).
Brussels–Croydon ...	7	14	—	2	6	2 22	D.H. 34 G-EBBR (2h. 2m.)	D.H. 34 (2), V. (1), W. (1).
Croydon–Rotterdam–Amsterdam.	9	4	9	9	9	3 12	Fokker H-NABH (2h. 24m.)§	F. (7).
Amsterdam–Rotterdam–Croydon.	10	11	9	9	9	2 33	Fokker H-NABN (2h. 5m.)§	F. (9).
Totals for week ...	137	262	49	94	133			

* Not including "private" flights. † Including certain journeys when stops were made *en route*.
‡ Including certain diverted journeys. § Rotterdam.

Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. D.H.4 = De Havilland 4, D.H.9 (etc.).
F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. M. = Martinsyde. N. = Nieuport.
P. = Potez. R. = Rumpler. Sa. = Salmson. Sp. = Spad. V. = Vickers Vimy, Vulcan, etc. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc.:—Co. des Grandes Expresses Aériennes; Daimler Hire, Ltd.; Handley Page Transport, Ltd.; Instone Air Line; Koninklijkie Luchtvaart Maatschappij; Messageries Aériennes; Syndicat National pour l'Étude des Transports Aériens; Co. Transaérienne.

Incidental Flying.—During the week Capts. Stocken and Muir made several test flights on D.H. 9's for the Aircraft Disposal Co., and on the 8th Mr. Hayns left for Brussels on an Avro.

French Aero Salon

DECEMBER 15 next to January 2, 1923, is the date fixed for the next French Aero Salon—the eighth—to be held, as before, at the Grand Palais. The exact title has been changed to "Exposition Internationale de l'Aeronautique."

Royal Aero Club Coming-of-Age Banquet

TUESDAY, June 27 next, looks like being marked up as an historical milestone in aeronautics. On that date the Royal Aero Club hold their 21st Anniversary Banquet at the Savoy Hotel, and already there promises to be a record attendance of members and their supporters. The Duke of Atholl, the President of the Club, will take the Chair, and amongst those who will be present are the Duke of Sutherland, Air Chief Marshal Sir Hugh M. Trenchard, Rear-Admiral Sir Roger Keyes, Sir Travers E. Clarke, K.C.B., Capt. the Right Hon. F. E. Guest, etc.

It would be well for members of the Club to get their applications for seats along to the Secretary at 3, Clifford Street, without delay, as the accommodation is limited and there may be sad disappointment awaiting late comers, especially as members have the privilege upon this unique occasion of introducing friends, including ladies, so far as there are seats available. The price of the tickets is £1 1s.

CIVIL AVIATION AND SAFETY

The Cross-Channel Fetish

THE title chosen for these notes may be interpreted in two ways: it may be taken to refer to the safety from accident of passengers and pilots, and it may be read in its wider sense as meaning civil aviation in its relation to national safety. In the following the subject will be dealt with from both points of view, without an attempt at exhausting either. To do so would require several issues of FLIGHT. As the phase which is, perhaps, uppermost in the public mind at the moment, owing to recent regrettable accidents, is that relating to the safety of travelling by air, we will refer to that first.

As always after a flying crash, the daily Press has made the most of the accident to the Spad which fell into the Channel, giving the usual glaring headlines and blazoning the news from thousands of posters. This was followed by articles questioning the adequacy of the precautions taken by the organisation of the London–Paris route, and suggesting all sorts of improvements that ought to be made. Although we are very far from wishing to claim that the organisation of the London–Paris route is perfect, it is certainly and emphatically not so haphazard as might be imagined from reading various articles in the Press.

If we look upon the matter calmly and dispassionately, what has happened is that in one case two aeroplanes have collided under weather conditions of low visibility, and in the other a machine fell into the Channel for some cause at present unknown. Collisions still occur at sea, one not more than a few days ago, yet no one suggests that innumerable precautions over and above those already existing are required. Boating accidents occur almost every week; yet these, if involving the loss of only two or three lives, are reported, probably, in a two-line paragraph—or not at all.

Precautions Taken in Manufacture

Let us examine, briefly, what are the precautions taken to ensure the safety of passengers on the London–Paris service. Before a machine is built, detail drawings of its constructional parts, accompanied by stress calculations showing the factor of safety of every stressed part, are submitted to the Air Ministry experts. The drawings and calculations are gone over very carefully, and if any part is found which does not satisfy the Air Ministry requirements the designers are asked to re-design it. When all drawings and calculations have been thus inspected, and not until then, the designers are allowed to proceed with the construction. Does the Government supervision end here? By no means. Every bit of material used in the machine, be it metal, wood, fabric or dope, is inspected by the Aircraft Inspection Department, and stamped by them before being allowed to be put into the machine. While the materials are being turned into structural parts such as spars, struts, fittings, etc., an A.I.D. inspector is present to examine everything and to reject any part which does not satisfy him.

Finally, the machine is finished, and flown by the manufacturer's pilot. Having tuned the machine up until he is satisfied with its behaviour in the air, the manufacturer's pilot takes the machine to Martlesham Heath, where there is an Air Ministry testing station. Here the machine is put through a number of tests by Government pilots—tests of performance, stability, controllability, landing, etc. When the machine has passed all these tests, and not until then, it is passed by the Air Ministry as fit for carrying passengers, goods or whatever load it has been designed for. Usually the machine then returns to the makers for further tests by their pilot, and when all these experts agree that the machine is as good as it is possible to make it, it receives its airworthiness certificate.

Daily Inspection

And does the Government supervision end here? Assuredly not. The Government, in the shape of the Air Ministry, insists that the machine shall be inspected *before every flight* by a competent expert known as a "ground engineer," who has passed Air Ministry examinations and is declared by the Air Ministry to be competent to judge of the condition of machine and engine (in the class and of the type for which he is licensed). This ground engineer is paid by the operational firm, who has no option in the matter as the Air Ministry insists upon his presence. The ground engineer is responsible to the Air Ministry for passing as fit for flying only such machines and engines as are really fit. If he should, in course of time, become too lenient, he would soon be found out and his licence would be withdrawn; in other words, he would lose his job.

Ground Organisation

We now come to the organisation of the air lines themselves—that is to say, the ground organisation, apart from the care and upkeep of the flying stock. At Waddon there are, in addition to the buildings in which machines and engines are housed and overhauled, wireless offices, meteorological offices, etc. Weather forecasts are sent out from the Air Ministry, and from wireless stations on the route reports are constantly coming in relating to the weather conditions there. Thus, frequently conditions are favourable at Croydon and Le Bourget, but there is a fog in the Channel, or at some point along the route to Paris. It is left to the discretion of the pilots whether, after receiving the reports, they will fly or not.

For use at night, or for machines which have been delayed and do not arrive until about dusk, there is a very complete lighting installation on the aerodromes, and lighthouses have now been erected at various points along the route, both in this country and in France. Recent test flights have demonstrated that, under normal conditions, it is as easy and as safe to fly by night as by day.

The wireless service is both of the ordinary and of the direction-finding variety. All British machines now carry wireless telephones, by means of which the pilot can be in communication with Croydon, Le Bourget and intermediate stations. It is, however, a fact that the French section leaves something to be desired in the manner of promptitude. Thus it is not uncommon for a pilot to be in touch with Croydon until he is well on his way towards Paris, and then he fails to get in touch with Le Bourget, which may be only a few miles away. Here there is undoubtedly room for improvement. But—and this is an important point—the French section of the route is about three times as long as is the British. It is therefore easy enough for us to say it should be improved. But, after all, French pilots are using the route as well as ours, and it is a matter of some delicacy for us to suggest how France should organise her air lines. Much can be done by conferences, but it should not be forgotten that, while at the moment the London–Paris route is, with the exception of the London–Brussels, our only one, it is one of the shortest in France, and France may well regard it as of very minor importance. In that case we can scarcely expect France to spend a great deal of money on it, mainly for our benefit, and without a great deal of goodwill from France the London–Paris route may well prove impracticable as far as we are concerned.

Some Absurd Complaints and Suggestions

During the week there have appeared in the Press letters and articles complaining about existing conditions or offering suggestions for improvements or extra precautions. While some of these have been very sensible and quite to the point, others have been of such a nature as to call for comment: for instance, Mr. Asquith's complaint that his daughters suffered from air sickness on a recent trip by air to Paris. We are very sorry to hear it, but we do think that they must have been most unfortunate in happening to have flown in very "bumpy" weather. Even so, was the passage any worse, we wonder, than a mildly rough Channel passage by steamer?

The suggestion has been made, also, that all machines should be compelled to carry two pilots. While in most machines this would be possible, it would be a somewhat severe tax on the operational companies, who already fail to pay their way, even with present subsidies, on the London–Paris route. On most British machines, it is true, an engineer or navigator is carried next to the pilot, but it is rather doubtful whether an engineer, even with a fair knowledge of piloting, could make a safe landing in case of the chief pilot being taken ill. It seems to us that a more economical solution, which would have other advantages, would be to equip machines with a stabiliser, unless the machine were already inherently stable. Large twin-engined machines have already been flown fitted with the Aveline stabiliser, which relieves the pilot of all control except directional. Even an engineer with only a limited knowledge of piloting should be able to make port safely on a machine thus equipped, while for flying in fog or in the dark the "automatic pilot" would relieve the pilot of a great deal of work. The Aveline stabiliser, it is true, weighs a good deal, but as machines are rarely flying with full loads nowadays, this would not greatly matter. At any rate, it would come cheaper than always carrying two competent pilots.

Another suggestion made is that the machines used should have lower landing speeds. To a certain extent we are in agreement with this view. We cannot view with equanimity a passenger machine which has to make a forced landing at a speed somewhere in the neighbourhood of 80 m.p.h. On the other hand, suggestions, emanating from people having a claim to be regarded as experts, that machines should be able to land at 20 m.p.h. are merely absurd, and only serve to give the non-technical an entirely false idea of the problems involved. In order that a machine could be landed as slowly as 20 m.p.h. it would be necessary to obtain a maximum lift coefficient of 1—which may be possible with high-lift wings, but the wing loading, even then, could only be just over 2 lbs./sq. ft. Such a machine, even if possible of production, would be useless for commercial purposes.

Yet another suggestion is that there should be many more wireless stations, listening posts, lights and what not. If all that is necessary, it points to the absolute unsuitability of the London–Paris route in view of the fact that it leads to nowhere. All these improvements would cost huge sums of money; and what should we have at the end of it all? An organisation which people might come from all over the world to see, but which would run into hundreds of thousands of pounds per year—all for a few thousand passengers who could probably afford to pay much more for their flights (and would do so) on unsubsidised machines. We have not the slightest doubt that the London–Paris route could be made absolutely safe, absolutely reliable and absolutely regular; but in view of the fact that even if it were, the volume of traffic would be wholly insufficient to pay even the interest on the capital, is it worth wasting money on? Frankly, we do not think it is. Support civil aviation we must, but why do it in the least profitable way?

Why Specialise on London-Paris?

Having realised this—that it is by the grace of our Ally, and solely by it, that we can run the London–Paris line at all—does not the question naturally arise: Why do we specialise on such a line? And this brings us to the wider scope covered by the title of these notes—Civil Aviation and national safety. It is now generally admitted, except by the Government, that our safety in the air depends upon a strong civil aviation. Does the London–Paris route offer any scope for building up a strong civil aviation? Does running the London–Paris service teach us anything which we did not already know in 1920? Does it promise ultimately to lead to expansion farther afield? We think that to all thinking people the answer of all these questions must be "No." Climatically the London–Paris route is one of the worst that could have been chosen. The two cities are already served by one of the best train and boat services in the world. Owing to the time wasted in getting to and from the aerodromes, the machines used on this service must be very fast—about 120 m.p.h., at least—in order to compete, in point of time, with existing facilities. This means relatively small carrying capacity; in other words, uneconomical machines. Owing to some extent to the already excellent travelling facilities, the amount of passenger traffic available on the London–Paris service is very limited. This is now beginning to become evident. Quite apart from any dropping in bookings that may have resulted from the two accidents referred to, there is not a great volume of passenger traffic, and yet three British firms have been subsidised to run services on this route. What is the result? That machines have to fly with half or quarter loads; that all three firms cannot possibly come within sight of making the services pay; that to carry on they will probably have to be further subsidised: in short, waste and inefficiency. If we could see that, sooner or later, the London–Paris services might reasonably be expected to develop, to expand, or if they were teaching us something, we should not feel disposed to begrudge a few thousands of pounds spent in keeping them alive during the earlier stages. But the London–Paris service, as far as we are concerned, is a blind alley; it leads to nowhere beyond Paris, as far as carrying passengers by British machines is concerned. It is scarcely to be expected that France would let a British company operate a service from, for instance, Paris to Marseilles. She would probably not object to our running a mail service across France, so long as we did not pick up mails and passengers *en route*, but, except on sufferance, the London–Paris line is to us a *cul-de-sac*, and the sooner we realise it the better. To continue to spend money on a route which can teach us nothing, for which an expensive ground organisation is necessary involving an expenditure out of all proportion to the amount of traffic existing, or which can reasonably be expected during the next few years, and which leads to nowhere, is sheer waste. That we must continue to spend money on civil aviation, and spend much more than we have done, is quite obvious; but that is not saying that we must continue to spend it in the direction in which there is least hope of a reasonable return.

When the London-Paris service was started in 1919 it formed a good test route. It was known to be bad from a meteorological point of view, but that had, at any rate, the advantage that if we could maintain a fair regularity under the conditions there obtaining we should be likely to be in a position to do so practically anywhere else in the world. The now defunct Aircraft Transport and Travel demonstrated beyond a doubt that it was possible to maintain a reasonably good regularity over that route. It also demonstrated that the machines used, converted war machines, did not and could not pay as a commercial proposition. That lesson having been learned, it might have been thought that those in authority would have commenced to look elsewhere for routes offering better prospects and being favoured by better climatic conditions. Not so. We still stuck to the London-Paris route—of which we do not complain, French competition and subsidisation made that necessary—but we stuck to it to the exclusion of all other routes. That is where the mistake was made. We now see the result.

Where the Seaplane Scores

As destructive criticism is of little use unless accompanied by suggestions for improvements, it may be well to examine briefly in what other directions we should have looked—and must look in the future—for better use of our money and brains. The case for the seaplane has been stated in FLIGHT in season and out for the last several years. We have made a point of publishing, whenever possible, full reports of articles and papers dealing with the design and construction of seaplanes, realising that a knowledge of the technical problems—which are quite different from, and considerably more difficult than, those relating to land machines—was essential if progress was to be made with the development of the seaplane. Lately we have had occasion to call attention to the neglect to which the seaplane has been subject in this country, and have published articles showing the use which other countries have made and are making of this type of aircraft.

The arguments in favour of the seaplane have been stated in this journal repeatedly, but they may be briefly summarised here. To begin with, the seaplane is not competing with express trains travelling at some 60 m.p.h., but with steamers having a speed of 20 m.p.h. at the most. In view of the fact that the steamer travels day and night, and assuming that at the moment this is not possible for the seaplane, we must approximately double the steamer speed to compete in point of time. That brings us to a speed of 40 m.p.h. necessary for flying during 12 of the 24 hours in order to make good the same distance as the steamer. If, therefore, the seaplane has a cruising speed of, for instance, 70 m.p.h. with a maximum speed of 100 m.p.h. or so, it will easily beat the steamer in point of time, and, moreover, at a cruising speed of 70 m.p.h. the power loading of a seaplane can be as high as 30–35 lbs./h.p. at cruising speed. In order to provide a reserve of power, the full-power loading should, of course, be somewhat lower, but even that may be as high as 20 lbs./h.p. or a little more. Now all these figures mean that a seaplane can carry a *paying load* (for a flying range of about 400 miles) of approximately 8 lbs. per horse-power. What land machine, of the speed necessary on the London-Paris route, could show a figure even beginning to approach this?

Then there is the question of aerodromes and ground organisation. Land machines require large and costly aerodromes, costly not only in first cost but also in upkeep. They necessitate—over a route like the London–Paris at any rate—a network of wireless stations, meteorological stations, emergency landing grounds for use in case of engine failure, lighthouses and arrangements for illuminating the aerodromes at night. The seaplane, always flying above its "aerodrome," does not require any of these. Use can be made of existing lighthouses, customs and passport organisations, without the need for establishing special ones. Thus any subsidy spent on seaplane services can be used, mainly, in developing better and better machines. Night flying, and flying in fogs, present far smaller obstacles to the seaplane than they do to the land machine. As long ago as 1913 Mr. Pemberton-Billing invented and constructed an instrument by means of which indication was given to the pilot when he was a certain distance, say 50 ft., above the sea. It was then a relatively simple matter to "land" the machine. Improvements have since been effected in instruments for

a similar purpose, and a trained seaplane pilot should have little difficulty in making a safe "landing" in the dark or in a fog.

On the question of forced landings a seaplane would be no worse off in stormy weather than is a land machine in a fog. As a matter of fact, the sea which a seaplane will negotiate (and by seaplane we mean flying boat at least as much as a twin-float machine) is largely a matter of size, as in the case of ships. What is a very heavy sea to a dinghy is only a ripple to a steamer, and so on. For use over fairly calm stretches of water a fairly small seaplane would be perfectly safe. For use over more open and disturbed stretches, the seaplanes used should be larger, but there is no difficulty in building fairly large seaplanes, even with the knowledge we have today. In this matter of size the seaplane is far better off than is the land machine. Doubling or trebling the size of a seaplane does not introduce any great problems, but a similar increase in the size of aeroplanes is attended with various difficulties. For instance, to mention but one, the bearing load on the wheel axles and the bearing area of the wheels themselves on the ground are matters which assume some importance in a very large land machine. An excellent instance of this was provided at the Elta show at Amsterdam. The aerodrome was newly laid down, and was, although fairly hard on the surface, decidedly soft underneath. The small light machines had no difficulty in alighting and getting off, but the large, heavy, twin-engined machines were bogged and stood on their noses.

From the point of view of seaplanes as a national necessity, it cannot be doubted for a moment that in the future great numbers of seaplanes will be required to co-operate with the Navy. If we are to gain the necessary experience in design and construction, and in the training of personnel, purely during routine work with the Navy, it will cost enormous sums of money if it is to be done on a scale commensurate with our requirements. On the other hand, if we choose to develop the seaplane along commercial lines (as well, of course, as along the highly specialised lines which the Navy will certainly demand), there is every prospect of being able to do this at a very reasonable outlay, owing to the excellent prospects which the seaplane offers of being a paying proposition, or very nearly so.

Some Seaplane Routes

With this brief outline of what the seaplane has to offer, let us turn to the question of its practical application in civil aviation. The possibility of being able to use rivers running through towns as "aerodromes" is a fascinating one, avoiding as it does the delay of travelling to and from an aerodrome situated several miles outside towns. In very many cities this would be feasible. Experiments have shown it to be feasible under favourable conditions both in London and Paris. Both rivers are, however, relatively narrow, are fairly crowded with surface traffic, and, finally, the route to Paris leads to nowhere as far as we are concerned. A service could undoubtedly be operated between the two cities, but it would have to be run with machines of light power loading, and therefore with small capacity for paying load. It is therefore questionable whether that route would offer any better prospects than do the existing land-machine routes.

We know that in the colonies and dominions there are innumerable opportunities for using the seaplane; but without going so far afield, let us examine whether there are not, nearer home, routes which could profitably be exploited. For instance, our road to Central and Northern Europe lies over Belgium, Holland, Germany, Denmark, Sweden and Norway. In order to reach all these countries it is necessary to cross an arm of the North Sea, or, at any rate, the Straits of Dover. Is there any reason why a flying-boat or seaplane service should not be run from some east coast port, or from the mouth of the Thames, to Antwerp, Amsterdam, Emden, Bremerhaven, Hamburg and onwards to Copenhagen, Stockholm and Christiania. In the case of a letter to Copenhagen, it takes three days from posting in London to delivery in Copenhagen. By a seaplane or amphibian service it should be possible to leave London early in the morning and be in Copenhagen the same night. In other words, a letter would not take more than 24 hours, instead of the 72 now taken. The saving to the other ports mentioned would be in proportion. For a passenger service it might be advisable to use one of the east coast ports as the seaplane terminus. At Harwich, for instance, there are already customs and passport facilities for Denmark and Holland. The train service is excellent (about 1½ hours), and the Felixstowe seaplane station might be taken into use.

Later on, when and if things settle down a bit in Ireland, a seaplane service between London and Ireland should help considerably in bringing the two closer together.

Again, in order to bring nearer such parts of the Empire as India and Australia, a flying-boat service from Marseilles (if French permission could be obtained) *via* Malta and Crete to Egypt, or possibly as far as Karachi, should be feasible. By linking up with the existing overland air route to Baghdad a very great saving in time could be obtained.

In India, Australia, New Zealand and Canada there are enormous possibilities, but it appears to us that the first step should be made at home, by bringing these places nearer to London. And how can we, except by airships, hope to do so without taking into our service the possibilities of the seaplane? Some of the routes indicated would take the seaplane over fairly long stretches of land, and might make the use of amphibians advisable. But even in an ordinary seaplane not so fitted we would far rather travel across country than we would across wide stretches of sea in a land machine. During the war it was repeatedly shown that, even with such a relatively primitive outfit as a "225," it was possible to penetrate quite far inland. The flying boat has, on occasion, been known to make quite a respectable landing on grass. But what land machine has alighted on the sea without serious damage to itself and, at least, great inconvenience to its passengers?

We could go on advancing reasons for seriously setting to work on seaplane development, but sufficient has, we think, been said to indicate the sheer folly of continuing to spend large sums on the London–Paris route, where the return is not, and cannot be for years, in the slightest commensurate with the outlay and expense of the organisation. We do not suggest that the London–Paris service should be stopped altogether, but we do think that one firm would be quite sufficient to subsidise on that route, and some of the money might be spent to far greater advantage in subsidising a few seaplane services which had, at least, a reasonable prospect of becoming self-supporting some day. That the London-Paris route will not be for years. And while we stick to this route, using land machines, England is and will remain "off the map."

Personals.

Married.

Flying Officer DUDLEY FISHER COX, R.A.F., the youngest son of Mr. and Mrs. H. R. COX, was married on June 6, at St. Jude's, Hampstead Garden Suburb, to DOROTHY, eldest daughter of Mr. and Mrs. BASTABLE, of The Gables, Woodlands, Hendon.

On June 7, at Stoke-Damerel Church, Devonport, Flight-Lieut. H. M. DANIEL, R.A.F., was married to MARGARET ANNA, youngest daughter of the late Mr. PERCY BULTEEL and Mrs. MATTHEWS, of Plymouth.

DOUGLAS GORDON NAIRN, Major, R.A.F., was married at Ottawa, on June 10, to FLORENCE MURIEL, daughter of Mr. and Mrs. MABEE, of Ottawa.

Capt. EVELYN JACK NEEDHAM, late Northants Regt. and R.A.F., elder son of the late Col. the Hon. H. C. Needham and the Hon. Mrs. Needham, of The Gate House, Windsor, was married on June 7, at St. Michael and All Angels, Warfield, to MARY CAMPBELL, only child of the late Rev. B. C. LITTLEWOOD, M.A., Vicar of Warfield, and Mrs. Littlewood, of Hillside, Bracknell, Berks.

To be Married

The marriage will take place on June 29 between GEORGE VEEVERS CARTER, R.A.F., and MARY GLADYS STARK, daughter of the late Dr. M. D. STARK, of Oxford.

The engagement is announced between GRENVILLE WAINWRIGHT WILSON, D.F.C., R.A.F., only son of Capt. A. C. Wilson, of Wilsonia, South Africa, and CICELY, youngest daughter of the late JOHN LANE DENSHAM, late of Waldronhyrst, Croydon.

FLIGHT

A NEW CZECHO-SLOVAK COMMERCIAL BIPLANE

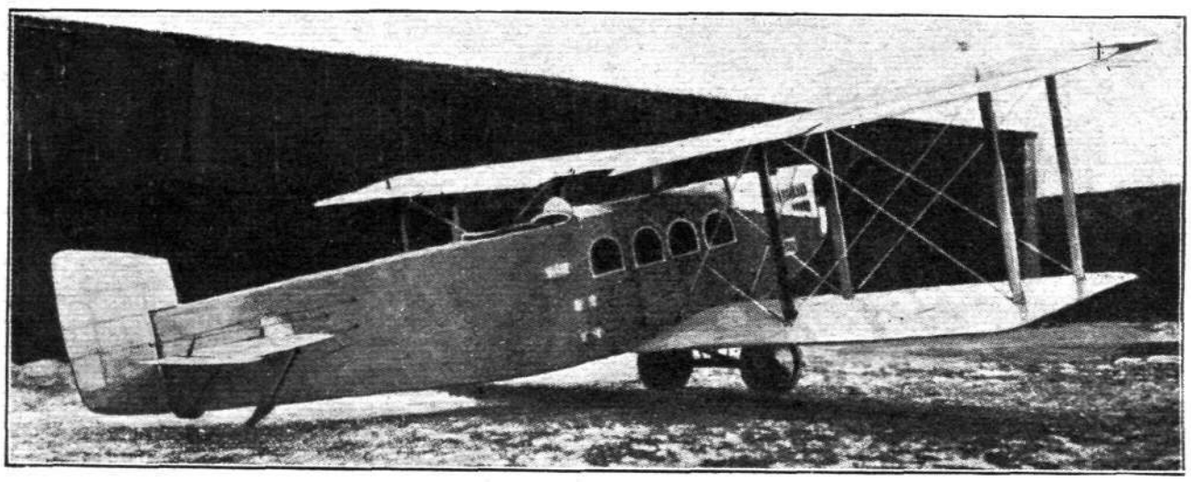
The Limousine Ae 10

IN the first commercial aeroplane to be designed and constructed in Czecho-Slovakia this re-born country has demonstrated that, in spite of the fact that up to a few years ago its aviation industry was conspicuous for its absence, it is already capable of taking its place amongst the foremost aircraft constructing nations. This new commercial machine has just been turned out from the works of the Aero Aircraft Factory of Prague, whose designers, MM. Husník and Vlasák, are to be congratulated in having produced a machine the general lines of which at once strike one as being both practical and pleasing to the eye.

The Limousine Ae 10 was designed to meet the needs of the growing demand for aerial intercourse with neighbouring countries, the Republic being determined to take an active part in the various aerial services running, and to be run, to and from Czecho-Slovakia. It is a tractor biplane, with a deep *fuselage* of good streamline form. The engine, a 260 h.p. Maybach Mb. IVa, is mounted in the nose and drives a 10 ft. 3 in. tractor screw. The radiator is mounted behind the latter, and has been found to give very satisfactory results, causing little resistance.

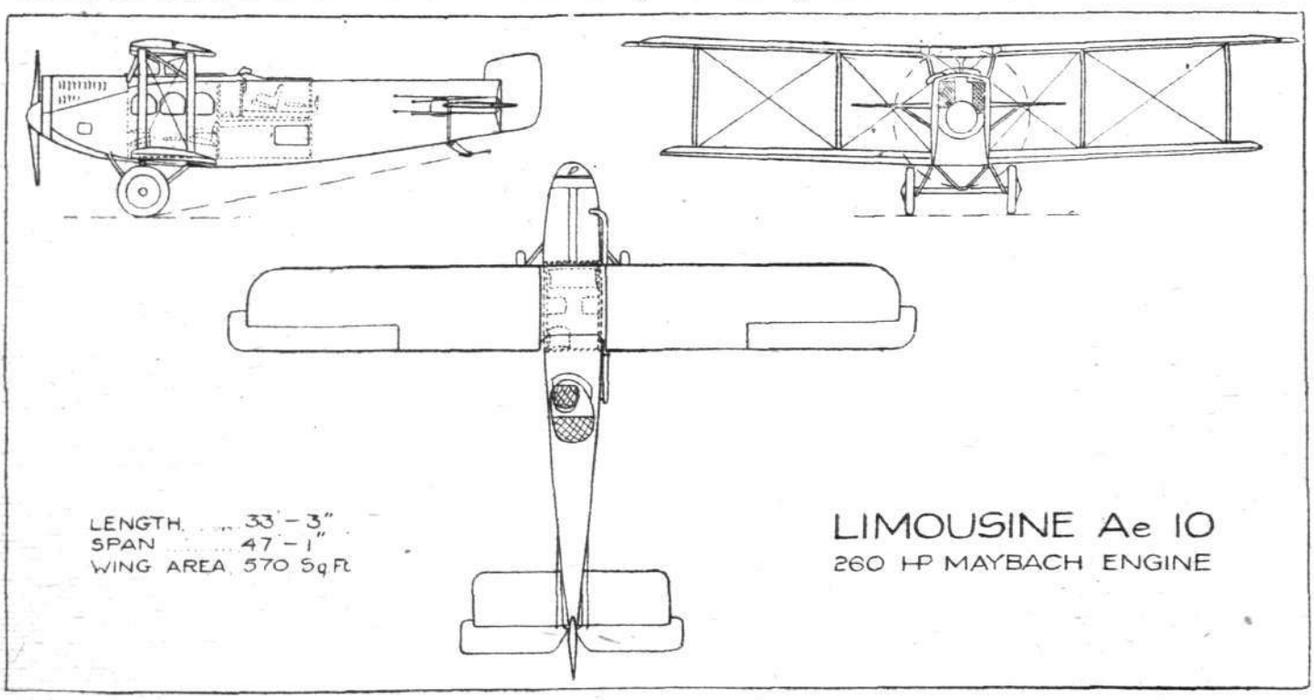
Behind the engine is an enclosed cabin accommodating three or five passengers, and separated from the engine compartment by a double metal-covered partition as a precaution against fire. The cabin is very roomy, well upholstered, and has double walls, ceiling and flooring, giving an exceedingly strong construction; it is also isolated and noise-proof, and so adds to the safety and comfort of the passengers. Three windows, glazed with Triplex, on each side of the cabin give a good range of vision, whilst the rear window may be used as a direct communication between the cabin and the pilot—conversationally, of course.

Access to the cabin is by means of a door on the right-hand side of the cabin. In the cabin are three comfortable seats, and two tables which are upholstered underneath, so that they can be tilted up and used as seats when two extra passengers are carried. At the rear of the cabin is a space for luggage, measuring 5 ft. 10 ins. by 3 ft. by 2 ft. Above this is the pilot's cockpit, just behind the main planes, from which an excellent view in all directions is obtained. Provision is also made for the accommodation of a navigator, who has a seat just behind the pilot, and both can easily change places if desired. A fire extinguisher, in direct communication with the engine and carburettor, is also located in this cockpit.



"Flight" Copyright

THE AERO CO. LIMOUSINE AE 10 COMMERCIAL BIPLANE : Three-quarter rear view.



"Flight" Copyright

THE AERO CO. LIMOUSINE AE 10 COMMERCIAL BIPLANE : General arrangement drawings.

The main planes are in five sections, the lower in two attached direct to the *fuselage*, and two upper attached to a small centre section. They are set at a dihedral angle, but no sweep-back, and the top plane has a very slight overhang. Balanced *ailerons* are fitted to the top plane only. The main petrol tank is carried in the top centre section, whence the petrol is led by gravity through a single pipe, *via* a filter, direct to the carburettor. The petrol system is thus of the simplest form possible. The tank is filled by means of a special pump, and the petrol passes through a filter before entering the tank.

The tail plains are of tubular steel construction, fabric covered, and consist of an adjustable rectangular horizontal stabiliser, mounted between the upper and lower *longerons* just above the line of thrust, two balanced elevators hinged to the stabiliser, and a balanced rudder. No vertical fin is fitted, as the flat sides of the *fuselage*, which tapers to a deep vertical knife-edge, renders this unnecessary. The controls are of the conventional type—elevator and *aileron* column, and rudder bar.

Special attention has been given to the undercarriage, as it was realised that many of the accidents are caused by faulty landing gear. The two wheels are of large diameter —960 mm.—with the object of enabling the machine to land on very soft and uneven ground. They are located well forward, which has the effect of giving a quick pull up. The wheels are mounted on a divided axle, with rubber shock absorbers, which is carried by twelve steel struts, having six points of attachment to the *fuselage*. These struts are arranged in three pairs of "M's," when viewed from the front, as indicated in the accompanying general arrangement drawings. Landing shocks are thus well distributed over the *fuselage;* in places the factor of safety is about 12, both in the landing chassis and cabin. Throughout the machine double wiring is employed.

The principal characteristics of the Limousine Ae 10 are :—

Span	47 ft. 1 in.
Chord	5 ft. 9 ins.
Length	33 ft. 3 ins.
Height	11 ft. 8 ins.
Area of main planes	570 sq. ft.
Useful load (3 pass.)	1,650 lbs.
Weight, fully laden	1,620 lbs.
Weight/sq. ft.	8·2 lbs.
Weight/h.p.	17.7 lbs.
Speed	93 m.p.h.
Duration	4 hours.
Engine	260 h.p. Raybach.

THE "SYLPHON" PETROL PUMP

AN interesting type of petrol pump is being used on Liberty "12" and Wright Model "H" engines in America. This pump, which is known as the "Sylphon," was designed with the object of replacing air pressure feed, where sufficient gravity head is not available. The principal features of this pump are that it eliminates troubles arising from glands, and their packing, and that it gives a maximum discharge pressure at high speeds and sufficient delivery of fuel at any speed, thus eliminating the employment of a relief valve.

The elimination of glands is achieved by the use of metalic (thin copper) bellows, which go by the name of "Sylphon," by means of which the petrol is drawn from the tank and delivered to the carburettor. The bellows are in duplicate, so that in the event of one pumping unit failing, the other will maintain sufficient fuel supply for all engine speeds.

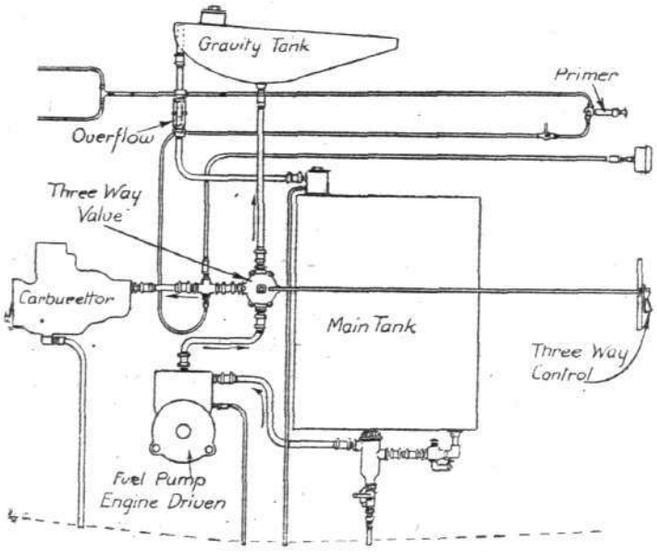
At present this pump is produced for use on the two engines previously mentioned—the Liberty "12" and the Wright "H"—but the only difference between the two models is in the drive-shaft and the base casing flange.

This pump consists of two main castings, a lower one containing the driving gear and the upper one containing the pumping units. In the lower casting is a four-pitch worm, shaft, coupled direct to the rear end of the engine crankshaft in the case of the Liberty, and to the magneto drive gear shaft in the Wright. The worn meshes with a 32-tooth worm wheel, giving an 8 to 1 reduction, which is carried by a bracket extending down from the partition separating the two castings. The worm wheel is attached to a camshaft, having a cam on each side, each of which actuates a cam roller attached to a vertical cam follower. The upper end of the cam followers extend into the bellows chamber, where they are attached to flanges to which the bellows are soldered. Bronze bushings are provided for the cam followers in the camshaft support, and in the base of the gear chamber.

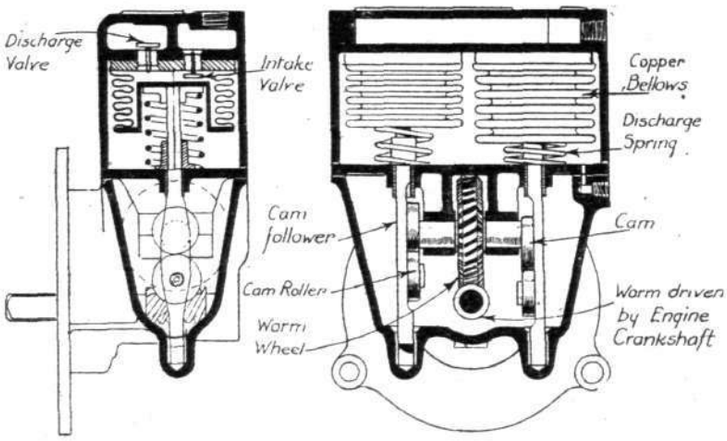
The upper ends of the bellows are soldered to a head plate in the upper casting, which also carries the inlet and outlet valves, these being, of course, in direct communication with the bellows. Between the bellows flange and the base of the bellows chamber is a coiled spring which tends to keep the bellows contracted.

The action of the pump is thus: As the worm rotates the worm wheel, the cams move the camfollowers down against the action of the spring, extending the bellows and drawing in a supply of petrol through the inlet valve. The bellows are then returned to the original position—discharging the petrol through the outlet valve—by the spring, which is designed to give a maximum pressure of 4½ lbs. per square inch, with a closed discharge. Thus, should the pressure of the petrol between the engine and the pump exceed that exerted by the spring, the bellows will remain extended and the cams will "idle" until the pressure falls.

There are two intake and two outlet valves, each a unit, screwed into the valve chamber, which forms the upper part of the bellows chamber. The valve chamber is divided by a partition, on one side of which are the two intake valves, and on the other side the two outlet valves. The valve units may easily be removed if necessary. Two outlets and two inlets are provided, so that connection may be made from the top or sides as required; plugs are screwed into the unwanted connections. A hole, having ⅛ in. pipe thread about one half way down on one side of the pump, is utlilsed as a drain in case a gasket or bellows leaks.



THE "SYLPHON" PETROL PUMP: Diagram showing a standard fuel system employing the "Sylphon" pump.



THE "SYLPHON" PETROL PUMP: Diagrammatic sketch showing the mechanism.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

LONDON TERMINAL AERODROME

Monday, June 12, 1922.

AIR passenger traffic shows no signs of improvement. It is in fact, if anything, rather on the downward grade. What makes it seem really worse than it really is is the comparison with last year, when machines were daily carrying full loads, while now there are so many machines running daily that, although the passenger traffic is almost the same as last year, there are very few travellers per machine, and the illusion of only a driblet of traffic is created. I am informed that the Handley Page Transport are, in fact, carrying a record number of passengers, but as they are running twice as many machines as at any previous time in their existence, their machines are by no means full.

The air-station is fairly seething with indignation against adverse articles in the daily Press; but there are a thinking few who are of the opinion that good will come of these articles in the long run, as they are bringing skeletons out of the cupboard, and may probably hasten remedial measures.

It is interesting to note that one day last week there were no fewer than 28 machines in and out between London and the continent, and the total of passengers for the day was only 27. There were, of course, mails and goods in addition.

London-Amsterdam Goods Service

THE goods traffic between London and Holland is developing rapidly, and the daily load is now in the neighbourhood of three-quarters of a ton. Passengers are really quite a side-line of this service, but even these have been increasing slightly. There is now a regular daily consignment of freshly-cut flowers arriving in London by air from Amsterdam, and on several occasions recently this traffic alone has been almost sufficient to fill one of the F. 111 monoplanes. Quite a novelty in aeroplane cargoes was a consignment of queen bees that arrived from Amsterdam on Thursday. Each queen bee was packed in a special container, a little larger than a matchbox, and with a perforated top to allow fresh air. They were immediately passed through Customs and motored to London where they were placed on the first express train to Dumbarton in Scotland.

With the gradual increase in the goods traffic the Customs officers have found their office accommodation rather cramped, and alterations which have given them another and pleasanter office, in addition to the old one, are now completed. In common with the rest of the Government staffs on the aerodrome, they have now to keep a constant attendance from before 5 a.m. almost to dusk.

The weather has been reasonably good all the week, with the exception of Friday morning, when the early-morning machines were unable to get away, and those leaving before nine o'clock were held up on the route to the coast.

Mr. Cobham's Flight from Belgrade

IT was unfortunate that this should have happened on this particular day, as Mr. Alan J. Cobham was expected to arrive after a particularly fine flight from Belgrade. Mr. Cobham is always departing to, or arriving from, some remote part of the map, so that his comings and goings do not now excite much attention; but on this occasion the details of the flight were exceptional. In order that *The Daily Mirror* should pander to the taste of its numerous women readers for wedding pictures, Mr. Cobham had undertaken to bring photographs of the royal wedding in Belgrade to London—a distance of nearly 1,200 miles—in a flight which, apart from the necessity of alighting for petrol, was practically continuous night and day. He was expected to arrive at the air-station between 2 a.m. and 3 a.m. on Friday morning, but after a ceaseless struggle with the weather, from Strasburg to south-east England, he was forced to descend finally at Penshurst at 8 a.m. and bring the pictures to London by motor, afterwards returning to Penshurst and, when the weather had cleared, flying his D.H. 9 back to Stag Lane.

The Daimler Airway still continue to run their one machine twice a day between London and Paris, and, in spite of its constant 1,000 miles a day, the regularity of the service is such that the arrival of "the red machine" over the aerodrome in the evenings gives workers in the gardens and allotments round about a very good idea of the time.

Vickers "Vulcan" on the Airways

THE Vickers "Vulcan" is now running regularly on the Instone Air Line services to Paris and Brussels. The Instone pilots have been making trial flights in the machine in order to get it on their licences, and on Saturday Mr. Powell, with seven passengers on board, in addition to goods and baggage, took the machine off in 14 seconds! The Instone Line have now arranged a round trip by air between London, Brussels, Paris, and back to London again.

Quite the most interesting event of the week was the night flight from Paris to London, and back, made by one of the Farman "Goliaths" of the Grands Express. Piloted by M. René Labouchere, and carrying eight passengers, the machine left Paris at 10.22 p.m. on Wednesday evening, and for the first section of the night flight had to contend with thunderstorms, and intermittent heavy rain and hail showers. M. Labouchere told me that at Beauvais the weather cleared somewhat, and by the time Abbeville was reached the conditions were perfect. The "cone-light" at Lympne was picked up when the night-flyers were still over France, and the lights at Croydon could be seen from Tonbridge.

The "Goliath" arrived at the air-station at 1.12 a.m., appearing over the aerodrome at a height of 8,000 feet. The navigation lights on the machine were plainly seen, even at this height, and the two headlights fitted below the *fuselage* were quite brilliant. M. Labouchere alighted on the aerodrome with the aid of the ordinary paraffin-flares and his own headlights. After an impromptu supper at the Trust House, the passengers embarked again in the machine and flew back to Paris, although the meteorological reports stated that the weather on the French side was becoming steadily worse.

This particular Goliath is not only fitted with navigation lights, but is also the only foreign machine on the airways fitted with wireless, while, in addition, the Aveline stabiliser is also installed. M. Gastou acted as relief pilot during the return night flight.

This flight is memorable as an indication of how near we now are to regular night flying. I understand, in fact, that the only thing that is stopping regular night operation on the airway is the attitude of the insurance companies, who are quoting very high premiums for the insurance of machines which are to be used at night.

Captain Muir, of the Surrey Flying Services, has been quite busy during the week-end with joy-riders, who now seem to be coming along in good numbers. During the week Captain Muir was again carrying out flights for the testing of a new type of parachute. I understand that the Surrey Flying Services are shortly sending out a joy-ride machine for a tour round England; or, alternatively, they may locate it at some popular spot where joy-riders are likely to be a paying proposition.

Mrs. Vernon Castle, the well-known dancer, hired a special Handley Page W 8 the other day in order to fulfil a dancing engagement in Paris, and she paid the Handley Page the compliment of saying that, had one or two chairs been removed, there was such steadiness in the machine's flying that she could have danced in the saloon while in the air.

Apropos the flower consignments from Holland—mentioned earlier in these notes—the interesting fact now transpires that flower-sellers in places other than London are beginning already to avail themselves of the speedy transport afforded by the air carriage from Holland. At the K.L.M. offices on the aerodrome, for example, a trunk call came through on Monday morning from Birmingham, asking that certain cases of flowers, from among the consignment due in on the machine arriving from Amsterdam at midday, should be so labelled that they could catch a train early in the afternoon at Euston for Birmingham—where the flowers would, in fact, arrive fresh that same evening, having travelled through all the way from Holland in a single day.

The K.L.M. are, by the way, putting on a special 6 a.m. monoplane on Wednesday to take newspapers over to Holland in connection with the European economic conference which, following upon the deliberations at Genoa, is about to open in the Peace Palace at the Hague.

The Avro Company has, it seems, received an order from the Russian Soviet Government for an Avro "Baby." The machine, while *en route* by air for Moscow, has apparently been delayed somewhere in Germany with engine trouble, and the other day Mr. Bert Hinckler went over by the monoplane service to Holland with a view to travelling on by train to the point where the machine was hung up, and dealing with the trouble, whatever it is, from his expert knowledge in the handling of this machine.

◈ ◈

An All-Metal Spad Monoplane

FROM Paris it is reported that M. André Herbemont, the famous Spad designer, has just completed loading tests of a new all-metal monoplane. No details are available, but we understand that the tests indicated a factor of safety of 13.5.

CENTRE OF PRESSURE COEFFICIENTS FOR AEROFOILS AT HIGH SPEEDS*

By W. S. DIEHL.

IT has been customary to calculate the strength of the rear wing beam for the "high-speed" condition on the assumption that the centre of pressure was at 0.50 of the wing chord. It can be shown that this assumption is not justified, regardless of the utility of a "high-speed" condition in strength calculations.

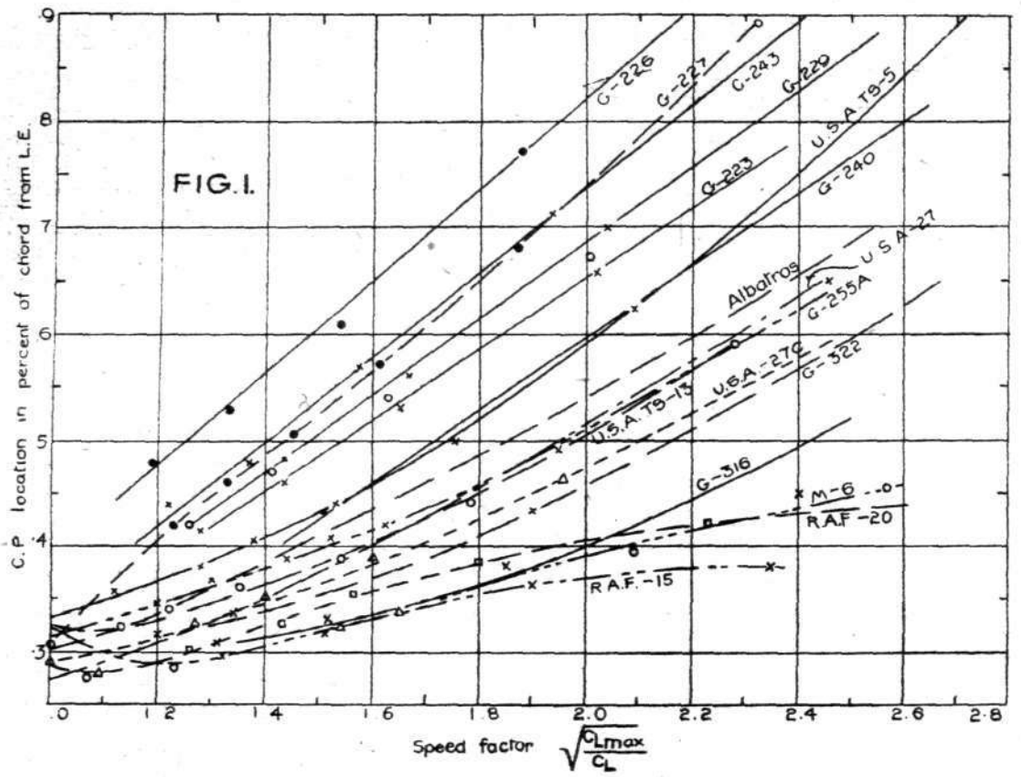


Fig. 1: Variation with speed of the centre of pressure of representative aerofoils.

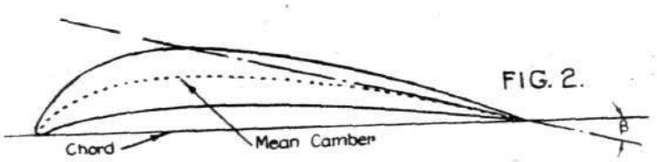


Fig. 2: Diagram showing "Angle of Trail."

In the course of an investigation of the C.P. movement for a series of aerofoils, it was found that the C.P. moves rearward more or less uniformly with increase in speed. This is shown in Fig. 1, in which the C.P. data for a number of notable aerofoils are plotted against the speed factor $C_{L_{max}}/C_L$. It will also be noted that there is a wide variation in the C.P.

* Technical Note No. 25 of American National Advisory Committee for Aeronautics.

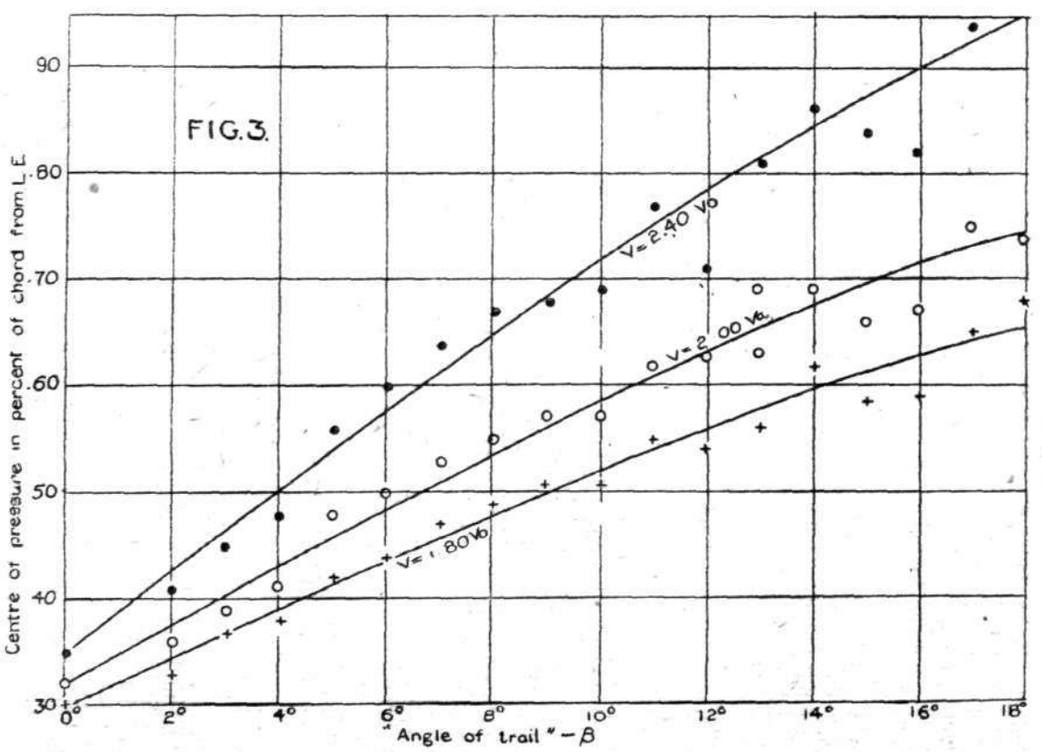


Fig. 3: Centre of pressure variation with speed and angle of trail. Göttingen aerofoils.

location at a given speed factor for the aerofoils given. The C.P. location at high speeds is invariably well forward for thin "high-speed" aerofoils and well aft for thick "high-lift" aerofoils.

It has been shown in a series of recent papers by some of the leading continental mathematicians that the centre of pressure for certain aerofoils may be calculated from the curvature of the mean camber. The methods are quite involved, and therefore useless from the view-point of the average engineer. It appears, however, that a practical substitute for the curvature of the mean camber is the "Angle of Trail," or angle between the chord of the aerofoil and the tangent to the curve of mean camber at the trailing edge, as shown in Fig. 2. The centre of pressure data for 117 aerofoils of the Göttingen series have been analysed in order to connect the C.P. movement with the angle of trail. The results are given in Fig. 3, in which the C.P. for three speeds, expressed in terms of the landing speed, are plotted against the angle of trail, β.

It is obvious from an inspection of Fig. 3 that the greater the angle of trail the further aft will be the C.P. at a given speed factor. It should be noted that the C.P. movement increases with an increase in β to such an extent that the usefulness of aerofoils of this class may be limited to aeroplanes having a low speed range, *i.e.*, ratio of maximum to minimum speeds. The assumption of 0.50 as the position of the centre of pressure at high speed is obviously without justification.

THE ROYAL AIR FORCE

London Gazette, June 6, 1922

General Duties Branch

The following are granted short service commns., for three years on the active list, as Flying Officers, with effect from, and with seny. of, the dates indicated :—A. W. Crees ; May 24. R. M. Taylor, M.C. ; May 24. F. B. Young ; May 26.

The following Lieuts., Army, are granted temp. commns. as Flying Officers, with effect from, and with seny. of, the dates indicated, on seconding for four years' duty with the R.A.F. :—F. W. G. Bedford, Black Watch ; March 7. G. Horsfield, R.F.A. ; April 9. H. P. Maltby, R.G.A. ; J. H. Tanner, R.G.A. ; S. McD. Watson, R.G.A. ; May 3. E. F. Colam, Middx. Regt. ; May 22. Flying Officer J. H. Woodgett is placed on the retired list ; June 7. The following Pilot Officers resign their short service commns., June 7 :—L. B. J. Bumstead, M.C. ; A. E. L. Scott-Atkinson.

Medical Service

J. Prendergast, M.B., B.A., is granted a short service commn, as a Flying Officer (Hon. Flight Lieut.), with effect from, and seny. of, May 15. E. Huntley, M.B., B.S., is granted a temp. commn. as a Squadron Leader with effect from, and with seny. of, May 22. Capt. W. E. Hodgins, M.B., R.A.M.C., is granted a temp. commn. as a Flight Lieut., with effect from, and with seny. of, May 24, on seconding for three years' duty with the R.A.F.

Nursing Service

Miss C. M. Moore resigns her appt. as Sister ; June 8.

Memorandum.

Second Lieut. L. G. H. Aspinall to be Lieut. (Ad.) ; Oct. 20, 1918. (Since relinquished). *Gazette* of October 25, 1918, concerning Lieut. P. C. Hoyle is cancelled.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the R.A.F. are notified :—

Wing Commander Francis E. T. Hewlett, D.S.O., O.B.E., from Headquarters (Coastal Area) to R.A.F., Depôt (Inland Area) (Supernumerary). 26.5.22.

Squadron Leaders.—A. B. Gaskell, D.S.C., from R.A.F. Base, Leuchars (Coastal Area) to Headquarters (Coastal Area). 1.6.22. J. C. P. Wood, from Half Pay List to R.A.F. Depôt (Inland Area) (Supernumerary). 1.6.22. E. A. B. Rice, M.C., from No. 6 Squadron (Iraq) to R.A.F. Depôt (Inland Area) (Supernumerary Non-Effective). 21.4.22. R. Rivers-Smith, M.B.E., from Stores Depôt, Egypt (Middle East) to R.A.F. Depôt (Inland Area) (Supernumerary Non-effective). 9.5.22. D. G. Donald, D.F.C., A.F.C., from R.A.F. Base, Leuchars (No. 3 Squadron) (Coastal Area) to command R.A.F. Base, Gosport (No. 3 Squadron) (Coastal Area). 1.6.22. F. H. W. Guard, C.M.G., D.S.O., from R.A.F. Depôt (Inland Area) to School of Technical Training (Men) (Inland Area). 22.5.22.

Flight Lieutenants.—L. G. Le Blount Croke from Composite Flight, R.A.F. Base, Gosport (Coastal Area) to No. 3 Squadron, R.A.F. Base, Gosport (Coastal Area). 1.6.22. A. W. Symington, M.C., from No. 39 Squadron (Inland Area) to R.A.F. Depôt (Inland Area) (Supernumerary Non-effective). 3.4.22. J. A. MacNab, from R.A.F. Base, Leuchars (No. 3 Squadron) (Coastal Area) to R.A.F. Base, Gosport (No. 3 Squadron) (Coastal Area). 1.6.22. C. Boumphrey, D.F.C., from R.A.F. Base, Leuchars (No. 3 Squadron) (Coastal Area) to R.A.F. Base, Gosport (No. 3 Squadron) (Coastal Area). 1.6.22. E. R. Openshaw, from R.A.F. Base, Leuchars (No. 3 Squadron) (Coastal Area) to R.A.F. Base, Gosport (No. 3 Squadron) (Coastal Area). 1.6.22. G. F. P. Warren, from No. 1 School of Technical Training (Boys) (Halton) to School of Technical Training (Men) (Inland Area). 1.6.22. W. B. Higgins, from R.A.F. Depôt (Inland Area) to School of Technical Training (Men) (Inland Area). 22.5.22. E. C. W. Fitzherbert, D.S.C., from R.A.F. Depôt, (Inland Area) to R.A.F. Base, Gosport (Coastal Area) (Supernumerary). 20.5.22. E. J. Cooper, D.S.C., from No. 230 Squadron (Coastal Area) to Marine and Armament Experimental Establishment (Coastal Area). 16.3.22. A. Hunter, O.B.E., from R.A.F. Depôt (Inland Area) to Marine and Armament Experimental Establishment (Coastal Area) 25.5.22. Trevor E. Salt, A.F.C., from No. 56 Squadron (Middle East) to No. 216 Squadron (Middle East) (Supernumerary). 18.4.22. C. Hanson-Abbott, from No. 230 Squadron (Coastal Area) to Marine and Armament Experimental Establishment (Coastal Area). 4.5.22. W. H. Park, M.C., D.F.C., from Aircraft Depôt, Egypt (M.E. Area) to No. 8 Squadron (M.E. Area). 25.1.21. J. C. M. Hay, from Aeroplane Experimental Establishment (Coastal Area) to No. 2 Armoured Car Company (Middle East). 11.4.22.

Aerial Route Weather Messages

THE Air Ministry announces that on and after June 15 the forecasts of the meteorological changes anticipated in S.E. England which are included in the aerial route weather reports issued by wireless telegraphy from the Air Ministry at 08.35 G.M.T., 11.35 G.M.T., and 14.35 G.M.T., will, for brevity, be issued in code and not in plain language as hitherto. Details of the code are to be found in "Forecast Code for the Abbreviation of Weather Forecasts transmitted by Telegraphy or Radio-telegraphy" (M.O. 244), which may be obtained from H.M. Stationery Office, price 1s. net.

For Aerial Gunnery Practice

THE Air Council has applied to the Board of Trade for consent for aerial firing practices to be carried out off Leysdown by aviation classes from the Royal Air Force Gunnery and Armament School at Eastchurch, which is situated between three and four miles from the proposed bombing range. The practices are proposed to be carried out between certain hours daily during summer and winter.

Long Service and Good Conduct Medal

THE Long Service and Good Conduct Medal has been awarded to the under-mentioned airmen :—

No.	Rank.	Name.	With effect from
365	S.M. 1	Edwards, A. ..	12.8.21.
87631	S.M. 1	Keen, R. S. ..	3.12.21.
166114	S.M. 1	Franklin, A. ..	5.1.22.
186074	S.M. 1	Hill, J.	1.2.22.
147400	S.M. 2	Whitley, H. L. ..	5.1.21.
185145	S.M. 2	Simmons, J. ..	7.5.21.
313624	S.M. 2	Bird, L. M. ..	4.5.21.
133516	Flight-Sgt.	Barnes, E. W. ..	1.3.22.
187852	Flight-Sgt.	Hunter, F. R. ..	17.1.21.
313853	Flight-Sgt.	Parry, T. ..	3.4.21.
428	Sergeant	Brown, G. C. ..	7.10.21.
302885	Sergeant	Riches, H. J. ..	16.2.22.

Award of Certificates to Ex-Naval Ratings

CERTIFICATES have been awarded to the under-mentioned airmen :—

314868	S.M. 2	Hughes, A. J. ..	1.1.22.
237555	Flight-Sgt.	Trowbridge, G. J.	4.1.22.
314937	Sergeant	Devlin, J. ..	1.1.20.

Move of No. 45 Squadron to Iraq

No. 45 SQUADRON has moved from Almaza (Cairo) to Baghdad, and was transferred for all purposes from the Middle East Command to the Iraq Command, with effect from May 15, 1922.

Paris-Marseilles-Paris

DURING last week two notable flights from Paris to Marseilles and back were made by French pilots. Lieut. Carrié left Le Bourget at 4.55 a.m. on June 9, and arrived at the Istres aerodrome at 9.50. Leaving Istres again at 12.25 p.m., he landed at Le Bourget at 4.35 p.m., having taken 11 hrs. 40 mins. total time, but only 9 hrs. 5 mins. flying time.

Lieut. Battelier left Le Bourget at 5.20 a.m. on the same day, and arrived at Istres (without landing) at 9.18 a.m. He left Istres again at the same time as Carrié (12.25), but was forced, by trouble with his *fuselage* bracing, to land at Lyon. He got his bracing repaired, and resumed his flight from Lyon at 6.25 p.m., arriving at Le Bourget at 8.57 p.m. His flying time was only 7 hrs. 45 mins. By train the journey from Paris to Marseilles and back occupies 26 hours.

SIDE-WINDS

Now that summer is here and organisers of "joy-riding" flights are once more getting busy, the question of proper housing of machines and a place where overhauls can be made becomes important. In this connection we would call attention to a stock of portable hangars held by the Vauxhall Trading Co., Ltd., of 4, Lloyd's Avenue, E.C. 3 (formerly of 37, Great James Street, Bedford Row, W.C. 2). These hangars were originally made by the Royal Aircraft Factory, and are specially constructed of waterproof flax canvas. A feature of these tent hangars is the ease with which they can be erected and dismantled, either operation being performed by six men in one hour. The larger size, measuring 70 ft. in width by 45 ft. in depth by 20 ft. in height, is sold at the very low figure of £120 for new hangars, while a second-hand one can be purchased for £70. A smaller size costs only £90 new.

\- - -

ACETYLENE welding, when used in aircraft, must be extremely well done if it is to be permitted at all. A good welded joint is probably as strong and as reliable as the metals joined, but the difficulty has been to ascertain when a weld is satisfactory and when it is not. During the war the difficulty became so great that it was necessary to prohibit the use of welding for parts that might be subject to heavy stresses. X-ray work on metals appears to provide a certain amount of information, but only after the weld has been made. Messrs. Allen-Liversidge, Ltd., of 106, Victoria Street, S.W. 1, at a luncheon given at the Hotel Cecil on June 9, gave a private exhibition of a new film showing acetylene welding. The film was of more than ordinary interest, inasmuch as it had been taken with an ultra-rapid camera, which revealed the action of the molten metal under the blowpipe. In addition to this side of the problem, which may well prove of great importance to metallurgical science, the film also showed how the actual Dissolved Acetylene gas was manufactured.

⁂ ⁂ ⁂ ⁂

Hottentots' Introduction to Aeroplanes

AEROPLANES have speedily brought home to the rebel Bondelzwart Hottentots a reminder of the power of aircraft to enforce order. The band of discontents have been practically surrounded near by the Haib River by the S. West Protectorate forces, after their position had been shelled by guns and the Air Force. The co-operation of the 'planes with the operating forces has proved of the greatest help in quickly bringing affairs to a head.

Following these first reports of the air operations against the rebel Hottentots, the Special Correspondent of the *Cape Argus* has elaborated the details of the effect produced upon the discontents. He states that the aeroplanes sent from Pretoria did more to strike terror into the rebels than the whole volunteer forces engaged. Their operations during the pursuit were particularly arduous owing to the absence of landmarks. Nevertheless, they were very successful, both in spotting the enemy and in locating our own patrols. In one case they discovered five police who, having lost their whereabouts, had been without water for several days. The airmen gave them biscuits and oranges, and carried away as a passenger one of the number whose horse had died of exhaustion.

A remarkable incident was the locating of a body of Hottentots in the mountain gorges at Hankiesdoorns. The machine that first spotted the enemy swung out from the gorge among the mountains on to a small rock-girt plateau 3,000 ft. high. On this desolate spot, strewn with boulders, there sat groups of Hottentots warming themselves by a fire. It was shortly after dawn. The pilot had a full load of bombs and ammunition, and chance had placed these rebels at the airman's mercy. The sudden rise in the altitude and the sharp change of direction had prevented their keen organs of sight and hearing from conveying a timely warning. Bombs were dropped from 100 ft., and machine-gun fire was opened. Many Hottentots tumbled into a gorge and ran from one side to the other of its rocky walls, which rose sheer to the summit. Scores were killed, and those who escaped fled in all directions, yet ten men could have held that summit against an army.

The Hottentots have named the aeroplanes "firebirds," and regard them with superstitious terror. One airman said that though they flew at a height of 50 to 100 ft. and inflicted heavy casualties, only once was a machine fired at.

Three-Engined Caudron Tested

WE understand that the three-engined Caudron biplane which was exhibited at the last Paris Aero Show has been flown by Poirée. The machine is stated to have flown perfectly, maintaining its height on two engines, and being well under control with one wing engine cut out.

THE LONDON AERO-MODELS ASSOCIATION

(The Society of Model Aeronautical Engineers.)

ON Thursday, the 8th inst., Dr. E. H. Hankin, D.Sc., gave a very important lecture before the members at Headquarters, 20, Great Windmill Street, Piccadilly, W. 1, on "The Possibilities of Achieving Artificial Soaring Flight," Dr. A. P. Thurston, D.Sc. (Lon.), presiding. A hearty vote of thanks was passed to Dr. Hankin by the enthusiastic members, and also to Dr. Thurston, the President.

On Thursday, the 15th inst., a committee meeting will be held at Headquarters.

On Thursday, the 22nd, a discussion will be held on Dr. Hankin's lecture with reference to the best method of experimenting with models for the purpose of attaining soaring flight, and it is hoped members will bring along wings built up on the flying fish principle, for demonstration purposes.

On Saturday, June 24, the Competition for Mr. F. J. Camms' Challenge Cup will be held on the Handley Page Aerodrome, Cricklewood. Entries should be sent in at the earliest possible moment to the competition Secretary, Mr. C. A. Rippon, 52, Fairbridge Road, Holloway, N. 19.

On Saturday, July 8, a Flight Golf Competition will be held for the Challenge Cup presented by the Editor of FLIGHT. Full particulars will be published next week.

Full particulars of the Association may be obtained from A. E. Jones (Hon. Sec.), 48, Narcissus Road, West Hampstead, N.W. 6.

⁂ ⁂ ⁂ ⁂

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motors
The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1921

Published June 15, 1922.

1,125. C. WEISMANN. I.C. engines for aircraft. (157,248.)
1,908. H. H. THOMPSON. Gyroscopic compasses. (157,986.)
6,123. D. J. MOONEY, E. E. BROWN and D. H. EMBY. Metal framework for aircraft. (180,074.)
6,884. R. S. CAPON. Apparatus for measuring drift angles. (180,094.)
8,238. H. M. FRANZEN. Aircraft. (180,119.)
8,807. H. J. PAYN. Landing gear. (180,132.)
11,635. J. ROBERTS. Aeroplane brake. (180,171.)
11,797. LUFTSCHIFFBAU ZEPPELIN GES. and P. JARAY. Alighting gear for lighter-than-air craft. (162,280.)
13,421. B. WEISS. Magnetic compasses. (180,199.)
23,081. J. KROPACZ. Aeronautic devices with flapping wings. (180,258.)
27,153. LUFTSCHIFFBAU ZEPPELIN GES. and K. STAHL. Airship gondolas. (170,301.)

NOTICE TO ADVERTISERS

All Advertisement Copy and Blocks must be delivered at the Offices of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, not later than 12 o'clock on Saturday in each week for the following week's issue.

FLIGHT

The Aircraft Engineer and Airships

36, GREAT QUEEN STREET, KINGSWAY, W.C. 2.

Telegraphic address: Truditur, Westcent, London.
Telephone: Gerrard 1828.

SUBSCRIPTION RATES

"FLIGHT" *will be forwarded, post free, at the following rates:—*

UNITED KINGDOM	s.	d.	ABROAD*	s.	d.
3 Months, Post Free...	7	7	3 Months, Post Free...	8	3
6 " " ...	15	2	6 " " ...	16	6
12 " " ...	30	4	12 " " ...	33	0

These rates are subject to any alteration found necessary under abnormal conditions and to increases in postage rates.

* *European subscriptions must be remitted in British currency*

Cheques and Post Office Orders should be made payable to the Proprietors of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, *and crossed London County and Westminster Bank, otherwise no responsibility will be accepted.*

Should any difficulty be experienced in procuring "FLIGHT" *from local newsvendors, intending readers can obtain each issue direct from the Publishing Office, by forwarding remittance as above.*